

Attachment 8 – Water Quality and Other Expected Benefits

Introduction

The six projects included in this application provide a variety of water quality and other expected benefits other than water supply. As a summary, the following is a list of non-water supply benefits that these projects provide:

- Financial: Reduced water costs, sustain agricultural economy
- Water Quality: Improvements to groundwater quality
- Ecosystem Restoration
- Flood Control
- Power Savings/Efficiency Improvements
- Increase Scientific Knowledge of Groundwater Basin

Project 1: Consolidated Irrigation District South and Highland Basin

In addition to the primary project benefit of creating an average annual water supply of 2,500 acre-feet for the region, the project will provide many additional benefits that are not easily quantified. The following is a list of some of these benefits.

Financial

- Economic benefits to CID
- Sustain agriculture by generating revenue for the District
- Low cost dry-year water supply for potential customers outside of CID

From **Attachment 7** and **Tables 11** and **12**, the economics have been evaluated. It should be noted that this evaluation used a conservative value of \$225/AF for supply for dry-year supply. Recently, some water sales within the San Joaquin Valley have approached or exceeded \$400/AF.

Water Quality

- Maintain the high quality water supply of CID, its neighboring districts, and cities and communities in the region.

With groundwater quality below most cities continuing to decline, the use of surface water for municipal use has improved drinking water quality. Generally, the surface water supplies have positively impacted the local groundwater supply. The project's recharging operations would mix high quality surface water supplies with lower quality groundwater supplies, thereby improving groundwater quality.

Ecosystem Restoration

- The fisheries management program on the Kings River is discussed Section 3.2.8 of the IRWMP. In addition, CID has committed to being responsible for increased flows to establish the fishery along the river. The fisheries program commits water to be diverted along portions of the Kings River that are upstream of CID's diversion point. In order for CID to commit water supply to the fisheries program without losing a portion of its supply requires a project like the one proposed. This project will allow CID to divert water down the river for the fishery to CID's diversion point, then store the water at the project location. CID will then be able to exchange and sell water stored at the project with other water agencies using CID's supplies in Pine Flat Reservoir. Further, partners like FID could then deliver the exchanged water to the City of Clovis, City of Fresno, or other demands.
- Provide seasonal habitat for migrating waterfowl along the Pacific Flyway using the project's recharge basins.
- Creation of fish & wildlife habitat including:
 - Creation of habitat for migrating birds.
 - Creation of wetlands habitat.
- Less demand on Delta and other sensitive water supplies, especially during dry years when they are stressed the most
- The project will provide food, water and habitat diversity for a variety of residential and migratory wildlife
- Facilitate and enhance the improvement of a fishery in the Kings River

Flood Control

- Provide more options in flood operations in conjunction with Pine Flat Dam
- Provide additional storage to help relieve periodic local flooding problems (erosion, riparian habitat damage and levee damage)
- Potential to reduce flood-related damage to sensitive habitat in the Kings River.

From the water supply analysis included in the project's feasibility study (see **Attachment 3b**), there is evidence that the project would have allowed for the diversion of approximately 77,000 AF of Kings River flood water over the past 50 years.

Power Savings

- Reduction in pumping costs as groundwater levels rise in local area

The development and use of the proposed groundwater bank project will likely create a groundwater mound directly below the project site, with groundwater levels gradually dropping to the original surrounding water table elevation going away from the project. Pumping costs in the vicinity of the project are anticipated to decrease due to the higher groundwater levels. The project's groundwater monitoring program will be used to manage banking operations to ensure there are no negative effects on surrounding wells and septic systems.

Scientific Knowledge

- Knowledge on recharge in within a region of CID not currently used for recharge
- Subsurface investigations within the project vicinity are providing additional and more detailed geologic and hydrogeologic information in the project area

The development of the project's feasibility study (see **Attachment 3b**), and its related geotechnical investigation and on-site percolation test, have allowed for more detailed information on recharge, groundwater levels and movement in the area. This information has allowed for greater awareness of potential project additions in the area.

Other

- The project is an integral part of Upper Kings Basin IRWMP
- The project is an integral part of CID's Groundwater Management Plan that seeks to restore and maintain a high quality and dependable groundwater resource for agricultural production both within the District and outside of the District.
- Reduce the need to deepen wells or lower pumps

Project 2: City of Clovis SWTP Expansion

Although not quantified in the required DWR tables the Expansion project will provide water quality and other benefits including:

- Reduced movement of contaminated groundwater plumes
- Reduced amount of average Total Dissolved Solids (TDS) when using surface water rather than groundwater.
- The sewer pipeline will be reducing truck traffic from the plant for the sludge removal.
- Reducing pumping costs at the existing wells
- Avoidance or delay of well deepening and modification required because of lowered groundwater levels.

Project 3: Fresno County Drummond Jensen Ave Sewer Connection Study

The proposed project will provide sanitary sewage disposal for the residents of the small disadvantaged community of the Drummond Jensen Avenue Neighborhood. Resolving sewage disposal issues and water quality issues in disadvantaged communities as proposed in this application is an important element of meeting local, regional, and statewide priorities.

The contrast between not undertaking the project and proceeding with the project is dramatic. Should the project not occur, the residents of Drummond and Jensen Avenue Neighborhood would continue to be served with failing septic tank systems that can contaminate groundwater and become a health hazard. The proposed project will improve the reliability of sewage disposal to neighborhood residents. This removes both a pollution problem and a health hazard for this region of Fresno.

The beneficiaries are not only the families living in the small neighborhood of Drummond Jensen, but also other residents in southern and southeastern Fresno. Groundwater contamination plumes in this region of Fresno have traveled in a northwesterly direction for the past several decades, as shown in the City of Fresno Nitrate Management Plan (**Attachment 3k**). As these plumes move northwesterly toward more populated areas of Fresno, additional city groundwater extraction wells pump contaminated water. This creates additional expense for the City of Fresno to appropriately treat drinking water and mitigate groundwater contamination problems.

There has been no cause and effect relationship between the high nitrate levels in drinking water wells in Drummond and Jensen Avenue Neighborhood and health issues of residents. However, statistical data from the US EPA indicates that infants drinking water that exceeds the primary drinking water quality standard for nitrate are susceptible to blue baby syndrome.

The benefits will be received not only after construction of the sewer system, but also after completion of the project study phase. By identifying and developing a feasible and cost effective design solution for a new sewer system, the new sewer project will be “shovel ready”. When additional funding is secured, the new sewer project would be able to be constructed without additional preparation studies or designs.

The eventual construction project will have a cost that will initiate a sewer user rate for each property located in the Drummond and Jensen Avenue Neighborhood. However, applications for grant funding, such as this, will help reduce debt costs to make the project more affordable to the neighborhood’s residents.

Project 4: East Orosi CSD Water Well Rehabilitation Project

The proposed project will provide a safe source of drinking water for the residents of the small severely disadvantaged community of East Orosi. Resolving potable water supply issues in disadvantaged communities, as proposed in this application, is an important element of meeting local, regional and state wide priorities. The proposed project will improve the reliability and water pressure in East Orosi's community water system, as well as potentially locating a zone of the aquifer with lower nitrate levels. An adequate source of supply and complying with minimum water pressure requirements helps assure that there will be no backflow conditions that could allow bacterial contamination of the water system to occur.

The contrast between not undertaking the project and proceeding with the project is dramatic.

Should the project not occur, the residents of East Orosi would continue to be served with a drinking water system that cannot meet peak demands and suffer from periodic water outages and low pressure conditions. In addition, the residents would continue to use drinking water that has high nitrate levels, periodically exceeding the EPA minimum contaminant levels, if the project does not occur.

There is some uncertainty that removing encrustations from perforations in East Orosi's two active wells will resolve the nitrate issue. However, the recommendation is made by geologist Kenneth Schmidt who has considerable experience in this field. By removing the encrustations from the perforations in the well casings, the wells will create less draw down and will be less likely to draw shallow groundwater that is contaminated with nitrates. At a minimum, East Orosi CSD should expect to experience increased water production from each well, as well as increased pumping efficiency, due to the proposed project.

The proposed water well rehabilitation project may have a cost that can increase water rates in the community of East Orosi if new production wells have to be constructed. However, applications for grant funding such as this will help reduce debt costs to make the project more affordable.

Project 5: City of Fresno Residential Water Meter Project (Area IV)

Without-Project Physical Conditions

The aquifer beneath the City of Fresno is presently in a state of overdraft. Based on long-term groundwater level measurements, the groundwater table has been in a state of decline since the end of World War II. Although efforts such as, public education and intentional recharge are being made to reduce water consumption and offset use, the aquifer continues to decline. The City has had to contend with challenges such as a voter approved City Charter amendment which prevented meter reading, and long running resistance to volumetric charges for this commodity. It wasn't until AB 514 that the City has finally been able to make significant progress to installing water meters and has developed a volumetric rate for delivered water. Projected without-project physical conditions were modeled as part of the preparation of the City's Metropolitan Water Resources Management Plan - Phase 1 Baseline Characterization report. Comparative evaluations were made from existing condition (ie. 2005) to future conditions (ie. 2030 and 2060). The without-project condition shows groundwater elevations will decline by as much as 30 feet in 2030 and as much as 50 feet in 2060. This modeling effort additionally showed recent past year groundwater declines averaged about one-and-one-half feet annually across the City. For 2009, the groundwater aquifer was overdrafted by approximately 30,000 acre-feet.

With-Project Physical Conditions

The City's ongoing preparation of the Metropolitan Water Resources Management Plan - Phase 2 Development and evaluation of Future Water Supply Plan report, shows how the physical condition of the groundwater system will improve through implementation of several projects, one of which is residential meter installation. This report forecasts there will be a 10% reduction in water use once all 110,000 residential services are equipped with water meters and AMR devices. This translates into an 11,090 acre-foot use reduction annually. The completion of citywide residential metering thus reduces the existing overdraft by one-third. The associated proportionate attribution of the proposed project area to attaining this reduction is 1,008 acre-feet. Completion of this project along with: the construction of additionally surface water treatment capacity; the development of tertiary treatment and distribution; and additional conservation, facilitates the elimination of groundwater overdraft entirely by the year 2025. The previously discussed model shows the successful implementation of all these projects will halt groundwater and sustain it at 2005 elevations all the way out to the year 2060.

Other Benefits

Water Quality Benefits

The City of Fresno relies on groundwater to meet 88% of its potable water demands. As with all groundwater sources, this resource has been and will continue to be exposed to a multitude of potential activity contaminants. The City has experienced wide-spread groundwater impacts by nitrates which has been associated to past historic practices of old meat packing facilities and wineries discharging wastes to percolation ponds. Additionally, there have been numerous occurrences of groundwater contamination from industrial operations. A water quality benefit attained through implementation of this project is the stabilization of the groundwater table and help assures containment of contamination plumes. By preventing continued overdraft, groundwater gradients will not be exacerbated and promoting migration of contaminants from remediation operations.

Additionally, the elimination of overdraft protects this resource from degradation associated to reaching the lower water quality waters in the deeper formations. Based on water quality samples collected from monitoring wells drilled prior to drilling the production well, many areas within the City have deep waters that have elevated concentrations of iron, manganese, and arsenic which exceed primary and secondary maximum contaminant levels. By maintaining optimal groundwater elevations, the City will be able to utilize this resource in a sustainable manner.

Power Savings Benefit

As described in **Attachment 7**, the installation of the 10,000 water meters and AMR devices will result in a 1,008 acre-foot savings annually. The project then also has a benefit of reduced use and a savings in power by not having to pump the presently used groundwater. The average monthly pumping cost is \$65 per acre-foot. The annual savings benefit then obtained by the project is \$65,520.

Local, Regional, and Statewide Benefits

Local Benefit

As has been previously discussed, the groundwater water aquifer overlain by the Fresno Metropolitan Area, inclusive of the adjoining City of Clovis, is in a state of overdraft. Both cities continue to expand opportunities of conjunctive use to alleviate the strain on the groundwater system. The implementation of metering residential services yields an immediate local benefit of restoring the groundwater system so it remains a vital and sustainable resource available in perpetuity. Without the proper use and management of this resource the continued vitality of the local economy becomes jeopardized. A sustainable and reliable water supply is a fundamental component to ensure the prosperity of a community.

Regional Benefit

The Upper Kings Basin Integrated Regional Water Management Plan documents that the region is overdrafted by about 100,000 acre-feet annually. Nearly every community in the plan area relies entirely on groundwater for their potable needs. Additionally, numerous agricultural operations utilize groundwater for irrigation. All of these uses have created an overburdening strain on this limited supply. The successful completion of this project contributes to the reduction of the present regional problem. This project and the City's entire metering project will reduce groundwater overdraft by 1,008 acre-feet and 11,000 acre-feet, respectively. The development of efficient utilization of this resource helps alleviate its use beyond which is sustainable and improves the region's ability to maintain a vigorous municipal and agricultural economy.

Statewide Benefit

The State of California in whole recognizes that available water supplies are marginally able to meet existing statewide demands let alone of supporting any additional demands from population growth or economic development. Each local and regional project and partnership that improves their water supply issues, incrementally contributes to the overall health of the State's overall water supply portfolio. This project and the City's entire metering project will reduce groundwater overdraft by 1,008 acre-feet and 11,000 acre-feet, respectively.

Beneficiaries

Completion of this project along with the entire citywide project of installing residential water meters benefits all of the City's residents, businesses, and institutions. The residents are assured water will always be available for their use and will be of appropriate quantity and of a quality that is not detrimental to their health. Businesses and institutions likewise benefit by having a potable supply sufficient to meet their needs and allow them to operate cost-effectively. By being proactive in addressing water resource management the City will be in a position to support economic growth and development in the region, which is important to the overall health of the state's economy.

Timing for Realization of Benefits

Although the citywide effort to install meters on residential services won't be completed until January of 2013, benefits of this project will have an almost immediate realization. Project initiation will occur in approximately January of 2011. With a projected duration of about six months, and an allowance for customers to receive and adapt their water usage habits to comparative billings over a two month period, the City expects to see measurable benefits by August or September of the same year for the completed area.

Uncertainty Associated with the Benefits

In the preparation of the Metropolitan Water Resources Management Plan, the consultant provided a range of estimates for reduced water use from 10% to 20% as have need experienced in other communities throughout the state. So as not to be over-reliant on the reduction of water use attributed to metering, the City has adopted an expected realization of reduced water use to be about 10%. This expectation is conservative, but emphasizes the need for other projects to perform at equal or higher levels of attainment.

In regards to measurable benefit for water quality, only time will tell how existing contaminant plumes behave. Continued monitoring is required of these plumes to ensure remediation capture and subsidence. Tracking the progress of this monitoring over time will provide a means to document the associated benefit this project. Maintaining efforts to obtain quarterly groundwater level measurements will provide a means to document the successful recovery of the groundwater beneath the City. Benefits will also be corroborated by observing reductions of groundwater pumping records. Overall, it is difficult at best to speculate the uncertainties associated to the project, but the expectations based on similar projects and the per capita water use of nearby communities presently utilizing water meters suggest a high potential for full realization of predicted benefits.

Project Adverse Effects

In the course of preparing the Residential Water Meter Implementation Plan for the overall project, an Initial Study was conducted and a finding that the proposed project would not have a significant effect on the environment was made. Subsequently, a Negative Declaration was prepared and accepted by the City Council.

Project 6: Bakman Water Company Water Meter Installation Project

In addition to the primary water supply benefit of conserving water by reducing water consumption, this project will reduce pumping costs due to the reduced water demand resulting from the water meter program. To quantify the power costs associated with the reduction in pumping, an annual cost per acre foot of \$61 was used. This is the average cost of power paid by Bakman on an annual basis per acre foot of water pumped from groundwater wells. Water quality and other expected benefits are summarized in Table 16.

While not quantifiable at this time, the project also provides a water quality benefit in that the reduction in groundwater pumping will slow the movement of contamination plumes in the area. Ultimately this will provide an economic benefit of avoided treatment costs and/or avoided drilling of new wells. At this time it is not possible to quantify those benefits because it is not known when contamination of the existing wells would occur due to the movement of these contaminants, nor the extent of the contamination problem that would occur.

Table 16 - Water Quality and Other Expected Benefits

(All benefits should be in 2009 dollars)

Project: Consolidated Irrigation District - South & Highland Basin Project - Full Funding

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit \$ Value	Annual \$ Value	Discount Factor	Discounted Benefits
		(Units)				(1)	(f) x (g) (1)	(1)	(h) x (i) (1)
2009									
2010									
2011									
2012	Wetland Habitat	AC	0	53	53				
2013	Wetland Habitat	AC	0	53	53				
2014	Wetland Habitat	AC	0	53	53				
2015	Wetland Habitat	AC	0	53	53				
2016	Wetland Habitat	AC	0	53	53				
2017	Wetland Habitat	AC	0	53	53				
2018	Wetland Habitat	AC	0	53	53				
2019	Wetland Habitat	AC	0	53	53				
2020	Wetland Habitat	AC	0	53	53				
2021	Wetland Habitat	AC	0	53	53				
2022	Wetland Habitat	AC	0	53	53				
2023	Wetland Habitat	AC	0	53	53				
2024	Wetland Habitat	AC	0	53	53				
2025	Wetland Habitat	AC	0	53	53				
2026	Wetland Habitat	AC	0	53	53				
2027	Wetland Habitat	AC	0	53	53				
2028	Wetland Habitat	AC	0	53	53				
2029	Wetland Habitat	AC	0	53	53				
2030	Wetland Habitat	AC	0	53	53				
2031	Wetland Habitat	AC	0	53	53				
2032	Wetland Habitat	AC	0	53	53				
2033	Wetland Habitat	AC	0	53	53				
2034	Wetland Habitat	AC	0	53	53				
2035	Wetland Habitat	AC	0	53	53				

2036	Wetland Habitat	AC	0	53	53				
2037	Wetland Habitat	AC	0	53	53				
2038	Wetland Habitat	AC	0	53	53				
2039	Wetland Habitat	AC	0	53	53				
2040	Wetland Habitat	AC	0	53	53				
2041	Wetland Habitat	AC	0	53	53				
2042	Wetland Habitat	AC	0	53	53				
2043	Wetland Habitat	AC	0	53	53				
2044	Wetland Habitat	AC	0	53	53				
2045	Wetland Habitat	AC	0	53	53				
2046	Wetland Habitat	AC	0	53	53				
2047	Wetland Habitat	AC	0	53	53				
2048	Wetland Habitat	AC	0	53	53				
2049	Wetland Habitat	AC	0	53	53				
2050	Wetland Habitat	AC	0	53	53				
2051	Wetland Habitat	AC	0	53	53				
2052	Wetland Habitat	AC	0	53	53				
2053	Wetland Habitat	AC	0	53	53				
2054	Wetland Habitat	AC	0	53	53				
2055	Wetland Habitat	AC	0	53	53				
2056	Wetland Habitat	AC	0	53	53				
2057	Wetland Habitat	AC	0	53	53				
2058	Wetland Habitat	AC	0	53	53				
2059	Wetland Habitat	AC	0	53	53				
2060	Wetland Habitat	AC	0	53	53				
2061	Wetland Habitat	AC	0	53	53				
2062	Wetland Habitat	AC	0	53	53				
Project Life								...	
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table) Transfer to Table 20, column (f), Exhibit F: Proposal Costs and Benefits Summaries									
Comments: - Creation of wetland habitat is assumed to be only a physically quantified benefit.									

(1) Complete these columns if dollar value is being claimed for the benefit.

Table 16 - Water Quality and Other Expected Benefits

(All benefits should be in 2009 dollars)

Project: Consolidated Irrigation District - South & Highland Basin Project - Reduced Funding

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit \$ Value	Annual \$ Value	Discount Factor	Discounted Benefits
		(Units)				(1)	(f) x (g) (1)	(1)	(h) x (i) (1)
2009									
2010									
2011									
2012	Wetland Habitat	AC	0	28	28				
2013	Wetland Habitat	AC	0	28	28				
2014	Wetland Habitat	AC	0	28	28				
2015	Wetland Habitat	AC	0	28	28				
2016	Wetland Habitat	AC	0	28	28				
2017	Wetland Habitat	AC	0	28	28				
2018	Wetland Habitat	AC	0	28	28				
2019	Wetland Habitat	AC	0	28	28				
2020	Wetland Habitat	AC	0	28	28				
2021	Wetland Habitat	AC	0	28	28				
2022	Wetland Habitat	AC	0	28	28				
2023	Wetland Habitat	AC	0	28	28				
2024	Wetland Habitat	AC	0	28	28				
2025	Wetland Habitat	AC	0	28	28				
2026	Wetland Habitat	AC	0	28	28				
2027	Wetland Habitat	AC	0	28	28				
2028	Wetland Habitat	AC	0	28	28				
2029	Wetland Habitat	AC	0	28	28				
2030	Wetland Habitat	AC	0	28	28				
2031	Wetland Habitat	AC	0	28	28				
2032	Wetland Habitat	AC	0	28	28				
2033	Wetland Habitat	AC	0	28	28				
2034	Wetland Habitat	AC	0	28	28				
2035	Wetland Habitat	AC	0	28	28				

2036	Wetland Habitat	AC	0	28	28				
2037	Wetland Habitat	AC	0	28	28				
2038	Wetland Habitat	AC	0	28	28				
2039	Wetland Habitat	AC	0	28	28				
2040	Wetland Habitat	AC	0	28	28				
2041	Wetland Habitat	AC	0	28	28				
2042	Wetland Habitat	AC	0	28	28				
2043	Wetland Habitat	AC	0	28	28				
2044	Wetland Habitat	AC	0	28	28				
2045	Wetland Habitat	AC	0	28	28				
2046	Wetland Habitat	AC	0	28	28				
2047	Wetland Habitat	AC	0	28	28				
2048	Wetland Habitat	AC	0	28	28				
2049	Wetland Habitat	AC	0	28	28				
2050	Wetland Habitat	AC	0	28	28				
2051	Wetland Habitat	AC	0	28	28				
2052	Wetland Habitat	AC	0	28	28				
2053	Wetland Habitat	AC	0	28	28				
2054	Wetland Habitat	AC	0	28	28				
2055	Wetland Habitat	AC	0	28	28				
2056	Wetland Habitat	AC	0	28	28				
2057	Wetland Habitat	AC	0	28	28				
2058	Wetland Habitat	AC	0	28	28				
2059	Wetland Habitat	AC	0	28	28				
2060	Wetland Habitat	AC	0	28	28				
2061	Wetland Habitat	AC	0	28	28				
2062	Wetland Habitat	AC	0	28	28				
Project Life								...	
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table) Transfer to Table 20, column (f), Exhibit F: Proposal Costs and Benefits Summaries									
Comments: - Creation of wetland habitat is assumed to be only a physically quantified benefit.									

(1) Complete these columns if dollar value is being claimed for the benefit.

Table 16 - Water Quality and Other Expected Benefits									
(All benefits should be in 2009 dollars)									
Project: <u>East Orosi Water Supply Sustainability Project</u>									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit \$ Value	Annual \$ Value	Discount Factor	Discounted Benefits
		(Units)				(1)	(f) x (g) (1)	(1)	(h) x (i) (1)
2009					0		\$0	1.000	\$0
2010					0		\$0	0.943	\$0
2011					0		\$0	0.890	\$0
2012	Avoided project: Construction of 2 new wells	Lump Sum	0	1	1	\$2,314,300	\$2,314,300	0.840	\$1,943,131
2013								0.792	\$0
2014								0.747	\$0
2015								0.705	\$0
2016								0.665	\$0
2017								0.627	\$0
2018								0.592	\$0
2019								0.558	\$0
2020								0.527	\$0
2021								0.497	\$0
2022								0.469	\$0
2023								0.442	\$0
2024								0.417	\$0
2025								0.394	\$0
2026								0.371	\$0
2027								0.350	\$0
2028								0.331	\$0
2029								0.312	\$0
2030								0.294	\$0
2031								0.278	\$0
2032								0.262	\$0
2033								0.247	\$0
2034								0.233	\$0
2035								0.220	\$0
2036								0.207	\$0
2037								0.196	\$0
2038								0.185	\$0
2039								0.174	\$0
2040								0.164	\$0
2041								0.155	\$0
2042								0.146	\$0
Project Life									
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)									\$1,943,131
Transfer to Table 20, column (f), Exhibit F: Proposal Costs and Benefits Summaries									
Comments: The avoided project shown above is for the construction of two new production wells to replace the East Orosi CSD's existing two wells. Since East Orosi CSD currently operates and maintains two production wells, the estimated operations and maintenance costs would be no different than what East Orosi CSD currently experiences. The estimated life of the wells is anticipated to be 30 years for both the rehabilitated wells and the new wells as part of this avoided project.									

(1) Complete these columns if dollar value is being claimed for the benefit.

Table 16 - Water Quality and Other Expected Benefits

(All benefits should be in 2009 dollars)

Project: City of Fresno Water Meter Program - Area 4

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit (Units)	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit \$ Value (1)	Annual \$ Value (f) x (g) (1)	Discount Factor (1)	Discounted Benefits (h) x (i) (1)
2009	a				0		\$0	1.000	\$0
2010	a				0		\$0	0.943	\$0
2011	Conservation	acre-feet	0	1008	1008	\$65	\$65,520	0.890	\$58,313
2012	Conservation	acre-feet	0	1008	1008	\$67	\$67,486	0.840	\$56,688
2013	Conservation	acre-feet	0	1008	1008	\$69	\$69,510	0.792	\$55,052
2014	Conservation	acre-feet	0	1008	1008	\$71	\$71,595	0.747	\$53,482
2015	Conservation	acre-feet	0	1008	1008	\$73	\$73,743	0.705	\$51,989
2016	Conservation	acre-feet	0	1008	1008	\$75	\$75,956	0.665	\$50,510
2017	Conservation	acre-feet	0	1008	1008	\$78	\$78,234	0.627	\$49,053
2018	Conservation	acre-feet	0	1008	1008	\$80	\$80,581	0.592	\$47,704
2019	Conservation	acre-feet	0	1008	1008	\$82	\$82,999	0.558	\$46,313
2020	Conservation	acre-feet	0	1008	1008	\$85	\$85,489	0.527	\$45,053
2021	Conservation	acre-feet	0	1008	1008	\$87	\$88,053	0.497	\$43,763
2022	Conservation	acre-feet	0	1008	1008	\$90	\$90,695	0.469	\$42,536
2023	Conservation	acre-feet	0	1008	1008	\$93	\$93,416	0.442	\$41,290
2024	Conservation	acre-feet	0	1008	1008	\$95	\$96,218	0.417	\$40,123
2025	Conservation	acre-feet	0	1008	1008	\$98	\$99,105	0.394	\$39,047
2026	Conservation	acre-feet	0	1008	1008	\$101	\$102,078	0.371	\$37,871
2027	Conservation	acre-feet	0	1008	1008	\$104	\$105,140	0.350	\$36,799
2028	Conservation	acre-feet	0	1008	1008	\$107	\$108,295	0.331	\$35,846
2029	Conservation	acre-feet	0	1008	1008	\$111	\$111,543	0.312	\$34,802
2030	Conservation	acre-feet	0	1008	1008	\$114	\$114,890	0.294	\$33,778
2031	Conservation	acre-feet	0	1008	1008	\$117	\$118,336	0.278	\$32,898
Project Life								...	
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)									\$932,908
Transfer to Table 20, column (f), Exhibit F: Proposal Costs and Benefits Summaries									
Comments: Based on a 10% reduction in water usage, it is estimated that approximately 1008 acre-feet of pumping costs will be eliminated.									

(1) Complete these columns if dollar value is being claimed for the benefit.

Table 16 - Water Quality and Other Expected Benefits									
(All benefits should be in 2009 dollars)									
Project: <u>Bakman Water Company Water Meter Installation</u>									
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit	Without Project	With Project	Change Resulting from Project (e) – (d)	Unit \$ Value	Annual \$ Value	Discount Factor	Discounted Benefits
		(Units)				(1)	(f) x (g) (1)	(1)	(h) x (i) (1)
2009	Power Savings	\$/AF			0		\$0	1.000	\$0
2010	Power Savings	\$/AF			0		\$0	0.943	\$0
2011	Power Savings	\$/AF			0		\$0	0.890	\$0
2012	Power Savings	\$/AF	0	140	140	\$61	\$8,600	0.840	\$7,224
2013	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.792	\$20,434
2014	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.747	\$19,273
2015	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.705	\$18,189
2016	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.665	\$17,157
2017	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.627	\$16,177
2018	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.592	\$15,274
2019	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.558	\$14,396
2020	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.527	\$13,597
2021	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.497	\$12,823
2022	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.469	\$12,100
2023	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.442	\$11,404
2024	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.417	\$10,759
2025	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.394	\$10,165
2026	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.371	\$9,572
2027	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.350	\$9,030
2028	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.331	\$8,540
2029	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.312	\$8,050
2030	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.294	\$7,585
2031	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.278	\$7,172
2032	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.262	\$6,760
2033	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.247	\$6,373
2034	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.233	\$6,011
2035	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.220	\$5,676
2036	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.207	\$5,341
2037	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.196	\$5,057
2038	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.185	\$4,773
2039	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.174	\$4,489
2040	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.164	\$4,231
2041	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.155	\$3,999
2042	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.146	\$3,767
2043	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.138	\$3,560
2044	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.130	\$3,354
2045	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.123	\$3,173
2046	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.116	\$2,993
2047	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.109	\$2,812
2048	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.103	\$2,657
2049	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.097	\$2,503
2050	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.092	\$2,374
2051	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.087	\$2,245
2052	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.082	\$2,116
2053	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.077	\$1,987
2054	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.073	\$1,883
2055	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.069	\$1,780
2056	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.065	\$1,677
2057	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.061	\$1,574
2058	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.058	\$1,496
2059	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.055	\$1,419
2060	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.052	\$1,342
2061	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.049	\$1,264
2062	Power Savings	\$/AF	0	420	420	\$61	\$25,800	0.046	\$1,187
Total Present Value of Discounted Benefits Based on Unit Value (Sum of the values in Column (j) for all Benefits shown in table)									\$348,790
Transfer to Table 20, column (f), Exhibit F: Proposal Costs and Benefits Summaries									
Comments: Unit costs for power are based on average annual total pumping costs of approximately \$258,000 divided by average annual consumption of about 4,200 AF.									

(1) Complete these columns if dollar value is being claimed for the benefit.

